

**Code of Practice for the
TRANSPORT AND DISPOSAL OF
PETROLEUM STORAGE TANKS
AND RELATED WASTE**

Since this document was published the Health and Safety in Employment Act 1992 has been amended by legislation which came into effect from 5 May 2003. While the technical and general information in this document remains current, there may be instances where it does not reflect the changes contained in the amended Act. Your local Occupational Safety and Health Service office can provide further information or you may call:

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The code of practice has been jointly prepared by:

The Occupational Safety and Health Service of the Department of Labour,
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with the valued assistance of some of the main tank disposal **contractors**.

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1. OBJECTIVE

This code of practice has been prepared as a statement both of policy and of specific measures to be taken, to ensure safe practice in the transportation, dismantling and disposal of tanks that have contained petroleum products, and the handling and disposal of tank materials and related wastes with special regard for the highest level of protection for people, property and the environment.

2. SUMMARY

In addition to the recognised construction risks of excavation and handling of heavy objects, there are some special hazards involved in the transport, dismantling and disposal of tanks that have contained petroleum products.

These special hazards are particularly:

- Explosion and fire from petroleum products or vapours;
- Asphyxiation from vapours or lack of oxygen; and
- Toxic effects of petroleum products, vapours or wastes.

This code of practice sets out recommended ways in which these hazards may be minimised in the handling and disposal of petroleum product tanks and the related wastes.

3. INTRODUCTION

Concern for the environment and for the safety of personnel involved in the cutting and disposal of petroleum tanks and the health of those working with contaminated steel and petroleum wastes has led to a review of the existing procedures. This code of practice is the result of the review.

This code is intended to provide national guidelines for the ways in which work is to be carried out when disposing of tanks which have at any time been used for storage of petroleum products, including handling, transportation, storage of tanks, dismantling, collection and storage of related wastes and scrap materials prior to disposal. It also defines the special facilities and methods that need to be addressed by principals and contractors involved in the work.

It is primarily directed at those working with steel tanks that have been used for underground petroleum storage, to provide a basis for specific written procedures that shall be adopted by each contractor in terms of contractual arrangements between contractor and principal.

This code also provides a basis of recording the movement of the used tanks and dismantled material, and records of specific instructions for handling related wastes and their movement and disposal.

4. PURPOSE

To ensure that tanks that have contained petroleum products and which are to be disposed of will be transported, dismantled and disposed of safely and with due regard for the protection of people, property and the environment.

To ensure that any waste materials in or associated with these tanks (which may be toxic), are also handled, collected, stored and disposed of safely and with due regard for the protection of people, property and the environment.

To stipulate procedures and equipment that must be employed by all those concerned with the transport, storage, handling, dismantling and disposal of tanks, tank materials and related wastes to minimise the risks involved as far as is practicable.

To ensure that records of the progress of each tank and the related wastes through the disposal process are kept and that details of their ultimate treatment and disposal are also recorded.

5. SCOPE

This code of practice applies to the transportation of used petroleum storage tanks, the dismantling and disposal of the tank material, the collection of the associated waste, sludge and contaminated scale, the containment and movement of the waste to storage or treatment sites and the disposal of tank materials and wastes.

Although specifically produced to cover steel tanks that have been used for underground petroleum storage, the principles and procedures contained in this code are generally applicable to operations associated with the dismantling and disposal of all tanks and tank material, and the movement of scrap materials that have been used in the storage of petroleum products. Specific procedures must be written to cover the particular operations and conditions envisaged.

The detailed contractual arrangements entered into between the contractor and principal will define the extent of the responsibilities of each of the parties involved.

There may be separate contract arrangements between the principal and each of the various parties involved in:

- Removal of the tanks;
- Transportation of the tanks;
- Storage of tanks;
- Dismantling tanks, storage of tanks and collection of the associated wastes;
- Transportation of wastes;
- Storage of wastes;
- Treatment of wastes;
- Transportation and disposal of scrap steel; and
- Transportation of treated wastes and their disposal at approved sites.

6. DEFINITIONS

6.1 Applicable Regulations

Acts, regulations and/or bylaws that apply in the region, or municipality concerned, which apply to the work being carried out and to the equipment being used in the course of the work.

6.2 Approved

Approved by the appropriate authority.

6.3 Authority

The authority having statutory control over, or obligation to control a particular aspect of the works.

6.4 Contractor

The person or company engaged by the principal to carry out all or any part of the work involved in removal, transportation, storage of tank, dismantling operations, collection of tank materials awaiting disposal, treatment and disposal of wastes and scrap materials.

6.5 Competent Person

A person having the required training, knowledge and experience required to exercise sound judgement and to give direction for the safe execution of the work or section of the work involved, such as a skilled person nominated by the principal who has suitable training and experience in vapour testing and gas-freeing techniques.

6.6 Disposal

For the purposes of this code, disposal means tank cleaning, gas freeing, removing and disposing of hazardous waste in an approved process and location, cutting up the tank into appropriate sized sections, and transportation of scrap steel to a facility for melting down in a suitable furnace.

6.7 EXD, Flameproof

Certified flameproof to a standard approved by the Chief Electrical Inspector, Ministry of Commerce.

6.8 Gas Free

A container must only be treated as gas free after it has been exhausted of flammable and/or toxic vapours and inspected, tested with an approved vapour tester and certified gas free by a competent person, and remains at least 15 m clear of any potential source of product or vapour.

6.9 Hazardous Residues or Contaminants

Any dust, fume, mist, gas, vapour, liquid or other substance, the presence of which could create the threat of fire or explosion, asphyxiation and/or health problems to people, or any significant hazard to the environment.

6.10 Hot Work

Any source of ignition including any operations or equipment able to generate heat, fire or sparks, such as welding or cutting plant, plasma arc, power tools, radios, cell phones and any other electrical equipment not certified EXD or intrinsically safe. (See also 6.19.)

6.11 Inspector of Dangerous Goods

A person approved or declared an Inspector of Dangerous Goods under the Dangerous Goods Act 1974 and its subsequent amendments, including the Chief

Inspector, Inspectors of Dangerous Goods employed by the Occupational Safety and Health Service of the Department of Labour, and by local licensing authorities.

6.12 Intrinsically Safe

Certified “intrinsically safe” by an authority approved for this purpose by the Chief Electrical Inspector, Ministry of Commerce.

6.13 Licensing Authority |

A licensing authority within the meaning of section 7 of the Dangerous Goods Act 1974 and its subsequent amendments. |

6.14 Local Authority or Territorial Authority

A City Council, Regional Council, District or Community Council, and includes any other public body which the Department of Labour has declared by notice in the Gazette to be a local authority for the purposes of the Dangerous Goods Act 1974. |

6.15 Principal

The person or company that contracts to have the work carried out on its behalf.

6.16 Product

Any petroleum product, including Class 3 Dangerous Goods in liquid or vapour form.

6.17 Project Engineer

The person who is to administer the contract between the contractor and the principal on behalf of the principal. In most cases, the project engineer will be an employee of the principal. However, the principal may engage a third party to administer the works.

6.18 Shall, Must, Should, and May

The words “shall” and “must” are to be understood as mandatory and the word “should” as advisory. The word “may” means that discretion can be used.

6.19 Source of Ignition

Any agency capable of igniting a flammable gas, vapour or other combustible substance, and includes, but is not limited to, a fire, flame, spark, fuel lamp and any electrical equipment of a type not approved for use in the particular location where a flammable gas or vapour or combustible substance is or may be present. (See also 6.8 and 6.10.)

6.20 Tank/Vessel

Any container having a water capacity of 250 litres or more.

6.21 Vapour Testing Equipment (Explosimeter)

Portable instruments used to detect the presence of flammable vapour in air. Vapour testers used must be specifically designed and calibrated to detect the explosive range of the flammable vapours of the particular substance or substances likely to be encountered. Vapour testers are designed for a normal range of operation, and one instrument is likely to detect vapour for only a small number of products at ambient temperatures.

Each instrument must be certified by an approved authority, for use in hazardous locations.

6.22 Oxygen Meter

Portable or fixed instruments for measuring the oxygen content in the atmosphere.

Each instrument must be certified by an approved authority, for use in hazardous locations.

6.23 Vent Fitting

An approved vent having a minimum diameter of 40 mm and fitted with a brass gauze shield of not more than 500 microns.

6.24 Underground Tank

A tank used for storage of hydrocarbon products which is installed below the surface of the ground and entirely covered with backfill, and as defined in the Dangerous Goods Regulations.

6.25 UPSS

The whole Underground Petroleum Storage System used for underground storage of hydrocarbon products comprising underground tanks, all associated pipework, fittings, vents, fill points and dispensing equipment.

6.26 UPSS Code

The Code of Practice for the Design, Installation and Operation of Underground Petroleum Storage Systems published by the Occupational Safety and Health Service of the Department of Labour.

6.27 Wastes

All waste material found in or around the UPSS including the underground tank itself, its fittings and associated pipework, and any product or other liquid or solid material remaining in or on the tank.

7. SAFETY OF WORKS

7.1 General

All work on the site shall be carried out with due regard to the health and safety of persons employed on the work, other persons employed on the site, and the general public.

The work shall be carried out in accordance with all statutory regulations pertaining to safe work practices.

In many cases, the principal will have his/her own safety requirements, particularly in the case where the principal is a major oil company. This section sets a minimum standard for safety precautions to be observed and shall be read in conjunction with the Dangerous Goods (Class 3 -Flammable Liquids) Regulations 1985, the Health and Safety in Employment Act 1992 and any subsequent legislation or regulations and the requirements of the principal.

7.2 Permits, Regulations and Standards

The contractor shall be responsible for obtaining all statutory permits unless stated otherwise in the principal's contract documents. (See section 8.)

The work shall be carried out in accordance with all applicable statutory regulations, whether those regulations require a permit to be issued or not.

7.3 Safety of Contractor's Personnel

The works shall be carried out in accordance with all applicable occupational safety and health regulations, including those regarding work in excavations.

The contractor and the project engineer shall both make themselves familiar with the regulations, particularly as they impact upon the execution of the contract for site works.

7.4 Excavation Safety

In general, every effort should be made to obviate the need for persons to enter the tank excavation. Where this is avoidable, regulations shall be complied with, and particular care taken to eliminate any risks such as asphyxiation, presence of hydrocarbon vapours, or cave-in. No one shall ever enter an unshored or unbattered excavation unless the excavation has been certified to be stable by a competent person.

7.5 Safety of Third Parties

The contractor shall take all necessary precautions to ensure that the works are carried out in such a manner as to present no hazard to the site, customers, staff or the public in general.

The project engineer shall satisfy himself, on behalf of the principal, that all reasonable measures have been taken. This duty upon the project engineer shall in no way relieve the contractor from his responsibilities in this area.

Tank removal work may be undertaken as a separate contract with the principal. All excavations and work areas shall be barricaded, and authorised persons kept clear of such areas. Where work areas are open to the public or staff working on the site at night, the contractor shall provide and maintain adequate lighting to keep the area safe.

Particular care must be taken on sites that continue in operation whilst work associated with lifting and transportation of tanks is being carried out. Equipment and materials to be used on-site shall be organised in such a manner as to cause no hazard to persons on or near the site.

Notwithstanding the above, both the tank transportation/disposal contractor and principal should maintain appropriate insurance cover for any damage or injury to persons or property during the course of the works. (See Section 14.)

7.6 Safe Handling of Petroleum Products

Brief notes of general safety precautions are contained in appendix 7.

7.7 Electrical Equipment

Any electrical equipment can be a possible source of ignition. Where any petroleum products vapours or related wastes may be present, the location of these hazards must be considered and hazardous areas identified. The requirements

regarding electrical installations may be determined by applying the principle of zoning into regions of differing degrees of hazard in accordance with a code or standard specification as may be approved by the Chief Inspector Dangerous Goods (NZS 6101, parts 1 and 3 is an acceptable standard). Electrical equipment that is installed into any such zone must conform to the requirements of the Chief Electrical Inspector, Ministry of Commerce.

Any electrical equipment brought on site, whether temporarily or permanently, must either carry a flameproof certification approval by the Chief Electrical Inspector or be located outside any hazardous zone.

Any excavation must be regarded as a hazardous zone unless it has been inspected and certified “gas free” by a competent person within the last 12 hours and there has been no leakage, spillage or seepage of product or vapour into the excavation since that inspection.

7.8 Safety Training

Each contractor who engages in any of the activities covered by this code shall be responsible for appropriate training of all of his/her staff who may be engaged in those activities. Such training shall be carried out on a regular formal basis and should include at least a monthly safety training session conducted by a person having appropriate technical knowledge and experience in the subject.

The contractor shall keep a register of all such training listing details of each training session including:

- Date, time and duration;
- Personnel who attended;
- Topics covered; and
- Session leader.

8. AUTHORISATION, PERMITS AND CERTIFICATION

8.1 Certification

Before any contractor is engaged by the principal to undertake tank disposal work, his/her premises, equipment, operations and procedures must be inspected and approved both by an Inspector of Dangerous Goods and by the principal’s nominated adviser.

Such approval may be based on the following criteria. All relevant details are to be provided by the contractor:

- Written procedures for transportation, storage and disposal, all in compliance with approved standards or codes.
- Records confirming that all personnel who are required to handle dangerous goods are conversant with the procedures and hazards associated with removal, transportation, handling and disposal of vessels in which dangerous goods have been contained. This should include emergency procedures.
 - Consents and permits obtained from the relevant local authorities for:
 - Land use;
 - Discharge of waste water from the site;

- Current Dangerous Goods Licence covering storage and disposal area; and
- Approval from Local Authorities for disposal of hazardous wastes at landfills and/or other approved methods.
- Insurance appropriate to the contractor's activities covering:
 - Public liability property damage, including pollution cover;
 - Public liability personal injury; and
 - Vehicle fleet insurance for land transportation of hazardous substances.
- Transport certification for compliance of vehicle and driver.
- Vapour tester of a type and model approved by the Chief Inspector of Dangerous Goods for use with petroleum vapours, including those from leaded gasoline. It shall be capable of:
 - Detecting the presence and concentration of petroleum vapours;
 - Detecting petroleum vapours from leaded gasolines without the explosimeter element being damaged or the calibration of the instrument upset;
 - Showing the lower concentrations in their relationship to the lower explosive limit (0 to 100%); and
 - Indicating higher vapour concentrations.

The explosimeter must be accompanied by a calibration test register giving calibration procedure and settings, signed by a competent person.

- Oxygen meter (if applicable) capable of measuring the oxygen content of the atmosphere to + 0.3% from 0 to 25% and having current calibration certificates issued by a recognised servicing organisation and a calibration test register signed by a competent person.
- Medical programmes in terms of section 8.5.
- Safety programme, and record of any accidents or incidents over previous three years.
- Site, plant and equipment suitable and adequate for the work undertaken. See checklist contained in section 15 of this code.
- Operators competent in the use of test equipment.
- Emergency response plan.

Should a contractor fail to maintain his/her procedures and practices, records and equipment to an acceptable standard, any existing approved certification may be withdrawn.

8.2 Work Authorisation

Only contractors accredited by an Inspector of Dangerous Goods and the principal will be permitted to carry out the work of transportation, storage of tanks, dismantling operations, collecting and storage of wastes and storage of steel awaiting disposal for underground petroleum storage tanks or other tanks that have contained flammable and/or toxic substances.

8.3 Ownership and Responsibility

It is to be clearly understood that tank ownership remains with the principal until the tank is written off and disposed of to the satisfaction of the principal or until ownership is formally transferred to another party. (See section 9.)

The contractor is responsible for the safe movement and final disposal of the tank in accordance with this code of practice, on receipt of the tank for transport and the accompanying documentation authorising the contractor to dispose of the tank. Where separate transportation and disposal contractors are engaged by the principal, both will require accreditation and specific authorisation for their respective functions.

8.4 Safety Procedures

See also section 11 — Tank Processing, and section 7 — Safety of Works

The three factors of the flame/explosion triangle should be monitored at all times: FUEL, OXYGEN (AIR), SOURCE OF IGNITION.

In the case of tanks that have contained hydrocarbons, it is usually the product or vapour that provides the fuel.

All tanks are to be treated as having contained leaded petrol, flammable liquid and vapours. The procedures are designed to ensure that the tanks are transported and dismantled with paramount importance placed on the safety of the workers involved and the protection of both the public and the environment. Procedures shall ensure that any remnant materials do not pose health hazards to persons/environment in either the short or the long term.

The fire-explosion hazard can be minimized by filling the tank with water. (Note: When the water is drained off the cavity can quickly gas up again as the product and water separate.) Natural or forced ventilation and prolonged weathering or purging with steam can also render the tank inert (refer section 11.4). Filling a tank with high expansion foam is not a recommended method of rendering a tank inert, but may be used as part of a total gas-freeing procedure. It should only be used when other methods are impractical.

Only technically competent and experienced personnel shall supervise the transportation and disposal of tanks.

The tank disposal area shall be fenced to prevent any unauthorised access.

Access to the dismantling area shall be restricted to those directly involved in the work being undertaken in that area.

No source of ignition shall be allowed within 15 metres of the dismantling operation unless the whole dismantling area and any tanks in it have been tested and certified gas free.

All electrical equipment shall be located in accordance with NZS 6101, Parts 1 and 3, and must conform to the requirements of the Chief Electrical Inspector, Ministry of Commerce.

8.5 Medical Examinations

Lead compounds (tetra ethyl lead) found in petrol are very toxic and pose a threat to workers involved as well as to others if correct procedures are not followed. Employers and personnel (whether permanent or casual) who work with tanks or handle wastes that may contain lead compounds, shall follow the procedures

contained in the *Code of Practice for the Control of Lead at Work* and comply with its medical surveillance provisions. Medical surveillance shall also be extended to cover any other people regularly employed on the site.

8.6 Audits

The contractor may be subject to annual audits by the principal's health, safety and environmental advisers, or other suitably qualified persons.

9. REMOVAL OF TANKS

The removal of underground petroleum storage tanks shall be **undertaken** in accordance with section 11 of the *Code of Practice for the Design, Installation and Operation of Underground Petroleum Storage Systems (UPSS Code)* and the methods referred to in that document shall be followed.

The removal of other tanks, e.g. skid tanks, above ground service tanks, lubricating oil tanks, shall be undertaken in accordance with the methods and practices referred to in this code of practice and as detailed by specific procedures agreed to between the contractor and the principal.

Where ownership of any tank that has contained an explosive, flammable or toxic substance is passed to another party, the provisions of sections 11.3 and 11.4 of the UPSS Code shall be followed. The person taking possession of the tank must be notified in writing that it is liable to contain flammable and/or toxic material or vapour. The typical disposal notice referred to as appendix B in the UPSS code is included as appendix 5 of this code of practice and may be used.

10. TRANSPORT OF USED UNDERGROUND TANKS

10.1 Conditions of Transport

Any tank that has held petroleum products may only be transported under the following conditions:

- The tank must be nominally empty. As much product as possible must be removed from the tank.
- The tank shall be fitted with an approved vent. All other openings are to be sealed, using steel plugs where practicable.
- The tank shall comply with the following labelling requirements:
 - Class 3 Dangerous Goods diamond label is to be displayed (400 mm x 400 mm dimension).
 - Warning to read: "Class 3 Flammable Liquid, no smoking or naked lights within 8 metres".
 - Tank shall display warning signs as per clause 11.1.7 of the UPSS code.
- A holed tank shall be fitted with effective seals, such as wooden plugs or strapped-on patch plates with gaskets, to ensure any residual product or vapour does not escape by this route during transport.
- To avoid confusion, tanks must be able to be individually identified.

10.2 Transportation

Transport facilities must comply with Dangerous Goods Regulations and MOT Regulations (as specified in the Standards New Zealand code NZS 5433: 1988 *The transport of hazardous substances on land*).

Where the tank is transported by road, the driver shall:

- Refrain from smoking at all times and ensure the load is kept well clear (8 metres minimum) from protected works and from all sources of ignition;
- Have a driver's licence endorsed special class hazardous certification;
- Shall not leave the load unattended in a public place; and
- Ensure the loaded truck is properly labelled and the necessary documentation is completed prior to departure.

The load shall be secure at all times. The Ministry of Transport's truck loading code, *Code of Practice for the Safety of Loads on Heavy Vehicles*, contains relevant requirements of this subject and is to be used as the minimum standard provided:

- Only timber-decked trucks (or steel-decked lined with timber dunnage) are used;
- Engine exhaust emissions are directed beneath the vehicle. Exhaust emission onto or above the tank is not allowed;
- Fabric straps, not chains are used to secure the load;
- Tank shall not be covered with a tarpaulin or any similar cover; and
- Lifting and lowering of the tank is by crane only.

The journey shall be limited to the points of pick-up and delivery, and shall be carried out as quickly as circumstances permit, with no unnecessary stops.

Should it become necessary to leave the vehicle unattended at any time, it must only be parked in a place approved by either the local dangerous goods inspector or a police officer.

The carrying of unauthorized passengers is prohibited.

A fire extinguisher complying with the requirements of Regulation 176 of the Dangerous Goods Regulations 1985 shall be carried in a suitable fitting permanently attached to the vehicle.

A cell phone should be carried in case of emergency but must only be used (unless intrinsically safe) outside any danger zone, i.e. at least 8 metres from, and upwind of the tank. (See also section 15.17.)

One set of reflective accident warning signs, as described in NZS 5433, shall be carried and displayed in case of breakdown or other emergency.

10.3 Delivery

The tank removal contractor must give the transporter and the person supervising the dangerous goods storage area, and/or the contractor who is to dismantle the tank, adequate notice of when a tank is to be uplifted and when it is to be delivered to the storage/disposal site. Such notice should be at least 24 hours where practicable.

Upon receipt at the dangerous goods storage area, the supervisor must mark the tank with an identification number. This number must be recorded in a register.

Refer to appendix 1. The principal's number should be on the tank and should be cross referenced with the permanent identification number.

Any tank that is holed or unsound should be placed on the disposal pad at the time of delivery to the disposal site. It should have any product pumped out and be thoroughly steamed or water washed internally prior to being stored awaiting processing.

11. TANK PROCESSING AND DISPOSAL

11.1 Preliminary

Too many tanks have exploded when believed safe. Take every care. Do not let it happen to you.

IF IN DOUBT, DO NOT PROCEED!

Treat all tanks as hazardous until checked, tested and certified gas free immediately before processing.

11.2 Hazards

The special hazards that must be managed are:

- Explosion and fire
- Toxic materials
- Asphyxiation

11.3 Explosion or Fire

Flammable vapour + air + ignition = fire.

Fire in a confined space = explosion.

Petrol, gasoline, kerosine and other light products = flammable vapour.

Diesel, lubricating oil and other heavier products + heat = flammable vapour.

Avoid fires and explosions by *eliminating* one or more of the three factors — vapour, air or ignition source.

11.4 Eliminate Vapour

Less than a litre of product is needed to produce an explosive vapour in a 30,000 litre tank. This could come from sludge or scale remaining in a tank.

Any trace of product remaining in a tank, even in the form of damp sludge or scale, indicates the probable presence of an explosive vapour.

Always wear appropriate breathing apparatus when approaching or working with a tank that is being purged of vapour.

Only tanks with manholes can be properly cleaned and tested for product or vapour.

Tanks without manholes must always be treated as hazardous until they have been opened up, thoroughly ventilated and cleaned.

Prolonged natural ventilation, over several weeks may allow all vapour to escape from a Class 3(a) product tank (petrol and other volatile highly products) provided the tank is raised on blocks at least 300 mm clear of the ground, in a horizontal

position, with all sockets open and at the lowest point of the tank circumference. Steaming the tank in a similar position for several hours can hasten the process provided condensate can drain freely and completely. If purging with steam, ensure the steam delivery nozzle, steam generator and the tank are all earth linked and introduce steam slowly in the initial stages.

Following steaming and cooling or prolonged ventilation the tank must be thoroughly inspected and tested for any remaining product or vapour by a competent person using an approved explosimeter and certified gas free before being cut up.

But, experience shows that neither steaming nor ventilation is 100 percent reliable and they should only be used with special care, and where other methods are impracticable.

Sludge and scale are still a problem until removed and the tank is clean and free from oil products.

11.5 Eliminate Air

Less than a litre of product is needed to produce an explosive vapour in a 30,000 litre tank. This could come from sludge or scale remaining in a tank.

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Prolonged natural ventilation, over several weeks may allow all vapour to escape from a Class 3(a) product tank (petrol and other volatile highly products) provided the tank is raised on blocks at least 300 mm clear of the ground, in a horizontal position, with all sockets open and at the lowest point of the tank circumference. Steaming the tank in a similar position for several hours can hasten the process provided condensate can drain freely and completely. If purging with steam, ensure the steam delivery nozzle, steam generator and the tank are all earth linked and introduce steam slowly in the initial stages.

Following steaming and cooling or prolonged ventilation, the tank must be thoroughly inspected and tested for any remaining product or vapour by a competent person using an approved explosimeter and certified gas free before being cut up.

But, experience shows that neither *steaming* nor *ventilation* is 100 percent reliable and they should only be used with special care, and where other methods are impracticable.

Sludge and scale are still a problem until removed and the tank is clean and free from oil products.

Air can be eliminated from a tank by completely filling it with water. If fitted with a manhole in the barrel of the tank, set the tank level on the disposal area floor with the manhole open and at the highest point.

If the tank has no manhole, set the tank on a slight slope so that there is a socket close to one end of the tank, at the highest point. This socket must be one which is

not fitted with a dropper pipe unless both socket and dropper are freely vented to the upper level of the tank by means of a hole (minimum diameter 12 mm) immediately below the tank shell level.

Drain or pump out any product remaining in the tank.

Plug any holes, and remove the plugs from all sockets so that all pipes and entries to the top of the tank are open. Flood the tank with water from a hose that reaches to the bottom of the tank. Avoid jetting or splashing in the tank, as this could generate static electricity, causing a spark and an explosion.

As water starts to flow from each nozzle or socket, close it until only the last socket at the high end of the tank is left open. Continue to run water into the tank fast enough to keep it completely full with a gentle but continuous overflow. Water must drain through a separator pit.

Provided there is no product evident in or on the water that is flooding out of the tank, the tank may then be considered safe to work on as long as it is kept full of water.

If, for any reason, water flooding cannot be used, a tank can also be made safe by first placing it in the same position as for water flooding outlined above, removing any product remaining in it and then dosing it with frozen carbon dioxide (obtainable from suppliers of industrial gases and commonly known as “dry ice”). The amount of dry ice needed is 2.0 kg per 1000 litres capacity (API Bulletin 16.04, 1st Edition March 1981).

When using dry ice, the following precautions must be taken to ensure that the tank is properly inert:

- Check tank contains no product.
- Open all tank top openings to allow vapour to be expelled.
- Crush the dry ice.
- Spread dry ice evenly over a wide area within the tank to achieve rapid evaporation.
- Keep all sources of ignition away while vapour disperses.
- When all dry ice has evaporated, check tank again for any residual product. If present, remove it and repeat dosage with “dry ice”.
- Check via all tank openings for vapour and oxygen content using approved instruments.
- Cut the tank open as soon as the tank is tested and certified gas free and the oxygen level is below 2 percent. (See section 11.11.)
- Do not allow time for carbon dioxide to disperse or for the tank to “gas up” again.

Alternatively, the tank can be made safe by filling with nitrogen. Liquid nitrogen should be used, and passed through an evaporator to transform it to a gas before it enters the tank. Gas must be fed into the bottom of the tank, so that air and vapour in the tank are purged out through the open nozzles, which must be at the top. The gas from the evaporator will be cold and must still be cold when it reaches the tank so that it will displace the air in the tank rather than mix with it.

However, it must not be too cold. Frost will form on the evaporator and possibly on the line taking the gas to the tank. Do not allow the frosting to reach the tank.

If it threatens to do so, reduce the nitrogen flow rate to the evaporator.

Check all tank openings for explosive vapour and oxygen content using approved instruments.

Cut the tank open as soon as the tank is tested and certified gas free and the oxygen level is below 2 percent.

Note: Both carbon dioxide and nitrogen will leave an oxygen deficient atmosphere in the tank. Do not enter the tank for any reason without full breathing apparatus until it has been thoroughly ventilated and tests show that the oxygen level has returned to normal (over 20 percent), and that all vapour has been eliminated.

11.6 Eliminate Sources of Ignition

When a tank is being cut up, there will always be a potential source of ignition. However, a cold cut hole using a pneumatic hole saw followed by a pneumatic nibbler is a much less intense potential source of ignition than is an oxygen/acetylene or a plasma arc cutting torch.

Cutting with a pneumatic nibbler is, therefore, the recommended method. Gas or plasma arc should (preferably) only be used on tanks that are full of water.

11.7 Personal Safety

See also the Associated Octel Company Limited publication 01/92 *Leaded Gasoline Tank Cleaning and Disposal of Sludge*.

11.7.1 Explosion

Only those immediately involved in the operation may remain at or near the tank while it is being cut.

Do not stand in front of, or pass by the tank end when cutting (by whatever method) is about to start or is in progress.

If there is an explosion, it is most likely to blow an end off the tank and the remainder of the tank may move some metres in the opposite direction.

Always cut from outside the tank, never from inside.

Always start cutting from the top of the tank.

11.7.2 Toxic Materials

After a tank has been opened, it must still be treated as hazardous.

Sludge and scale in the tank, and any rusty areas or protective coatings on inside surfaces will retain some absorbed product which will be released slowly on exposure to the open air.

In addition, sludge and scale are likely to contain dangerously high concentrations of toxic lead compounds.

Using breathing apparatus, full protective clothing and water or water blast, wash residual sludge and scale from the inside of the tank and from around the tank into a containment sump that will catch all particulate matter prior to transferring liquids into a holding tank. Refer to appendix 6 for typical site layout details.

Work from outside the tank as far as possible.

11.7.3 Personal Protection

Workers must use safety equipment suitable for the hazards involved. Refer to appendix 7: Safe Handling of Petroleum Products.

Workers involved in the cutting and sludge removal operation are required to take precautions against toxic vapours and lead-impregnated dust ingestion and shall wear the appropriate face masks or breathing equipment for these operations. Refer to section 7. They must have their blood and urine lead levels checked at least every six months. Refer to section 8.5.

Any worker who has facial hair, e.g. a beard, should not carry out work where a face mask or breathing apparatus is required as there can be an inadequate seal between face and mask.

11.7.4 Clothing

All workers engaged in tank cleaning, or who have any contact with sludge and scale must also wear a complete set of clean clothes, including underwear, and overalls every day and shall shower and change completely before leaving the site at the completion of each day. Laundry and hot shower facilities must be available at the site.

All-protective clothing shall be removed and placed in a building close to the processing pad area. Protective clothing worn during tank processing or cleaning shall not be worn in the lunch room or eating area.

11.7.5 Washing Before Eating and Smoking

Workers must carefully wash hands and face before each work break, before taking food or drink and before smoking. Smoking is only permitted in designated areas. Workers will be required to remove their overalls and wash face and hands before using lunch room facilities.

11.7.6 Normal Industrial Hazards

Personal protective equipment such as safety boots, gloves, eye protection, hearing defenders and hard hats are to be used in accordance with good industrial safety practice, and all relevant New Zealand regulations and codes of practice governing the operations undertaken. (Refer to section 13.)

11.8 Site Layout — Separation Distances

The whole site is to be securely fenced and equipped with appropriate warning signs. (See sections 15.17 and 15.18.) A typical site layout is shown in figure 1.

The tank processing pad shall be located at least 15 metres from any possible source of ignition.

Each tank awaiting processing shall be vented and stored not less than 10 metres from any area to which the public has access.

Note: If storage of unprocessed tanks exceeds 10,000 litres above ground of Class 3(a) or 3(b) or 50,000 litres of Class 3(c) the Chief Inspector of Dangerous Goods' approval is required (refer to section 15, Dangerous Goods Act, 1974).

11.9 Drainage System

The stormwater drainage system in the tank storage and treatment area must be such as to prevent rust, waste, or product being washed off the site onto another property or into any public drainage system, waterway or coastal water.

The storage site area shall be constructed so that product, sludge, scale and contaminated stormwater cannot soak into the soil and/or find its way into the ground water system.

11.10 Tank Processing

Do not attempt to cut any tank unless it is full of water (see section 11.5 above) or has been inspected, tested and certified gas free by a competent person immediately prior to cutting.

The method adopted to process tanks depends on several factors. These include:

- The tank construction.
- The product it has held.

Where positive evidence of the various substances the tank has contained over the whole of its operating life is not available, the tank shall be treated as having contained Class 3a leaded product (leaded motor spirit).

- The tank condition.

11.10.1 Tank Construction

Tanks come in different shapes, sizes and construction detail. The location of all fittings, including internal baffles or partitions, manholes, fill points, dip points, vents, suction points, and stiffeners shall be located and precautions taken accordingly in planning the work. For example, dual compartment tanks may have a coffer dam which may not be visible from an external inspection. Even if this tank is filled with water in both compartments, the coffer dam compartment can remain full of vapours and could explode when the tank is drilled in preparation for cold cutting.

Where a tank includes a coffer dam compartment, this compartment must be checked for both product and flammable vapour using a vapour tester, before any hot work is carried out on any part of the tank. It can be checked via the drain plug, if fitted. Where no drain plug is fitted, access to the coffer dam compartment for testing must be obtained by drilling a small hole through the tank shell from the outside of the tank under a continuous and copious flow of cold water.

The interstitial space of a double-skin tank must be checked for product or vapour in the same way. If product or vapour is found, the space must be flushed and filled with clean water before any further work is done on the tank.

11.10.2 Product

The product that has been in the tank and any special precautions to be taken must be positively identified by the principal. For example, fire-resistant hydraulic oils can contain ethylene glycol; cutting oils and hypoid gear oils can contain sulphurous and phosphor-based materials. These oils must be handled with caution. The project engineer should advise the contractor of any special precautions to be taken.

If the contractor is dealing with a tank that has contained a product with which he is not familiar, he must obtain guidance from the principal including the relevant product safety data.

11.10.3 Tank Condition and Cutting

Tank condition determines the method used to render the tank inert, (see 11.4 and

11.5 above). This in turn determines the cutting method selected. The preferred method of opening up tanks is by cold cutting, as even products that are normally nonvolatile can produce explosive vapour when heat is applied.

A report on the condition of the tank, including the size and location of any holes that may be found, must be recorded in the form required by the principal and as advised by the project engineer.

Oxygen under pressure is not safe with petroleum products or other hydrocarbons. Spontaneous combustion will occur in certain conditions. Do not use high pressure oxygen to clean scale or dirt from areas of tanks to be cut.

11.11 Method

At the time of processing, no more than one tank will be permitted on the disposal pad. The tank should be stripped of all fittings, and vents and manhole covers removed allowing the tank to vent. It should be lifted slightly at one end and any product and sludge air pumped or vacuumed out into prepared drums/containers.

Tanks in storage and tanks on the disposal pad shall be regarded as dangerous goods Class 3(a) and the particular rules requiring an isolation distance of 15 metres from any source of ignition shall be followed.

The tank shall then be rendered inert by either filling with water or by one of the other methods outlined in sections 11.4 and 11.5. If the tank is not filled with water, it is essential to have to hand an approved intrinsically safe vapour tester and certified operator during the processing, to monitor the status of the tank. It is also essential to allow the tank to cool before testing for vapour — most explosimeters only operate satisfactorily at normal temperatures.

An opening of 1 m² minimum should be cut in the top side of the tank, or the whole of one end removed.

Always work from outside and on the top side of the tank — never from inside, and never from the end. If the tank explodes it will almost invariably blow the ends out. It is not acceptable to crush tanks even when the ends have been cut out. Experience has shown that explosive cavities can be formed which cause dangers to the on processor. It also makes it impossible to deal with the scrap metal as specified in Octel Instruction Publication No. 5 — 01/92.

A Lower Flammable Limit reading will only be given from a Class 3(b) or 3(c) tank (e.g. kerosene, diesel or fuel oil) after it starts to fume. Where a Class 3(b) or 3(c) tank is badly holed and cannot be filled with water it should be purged with steam. The expelled air from inside the tank should be monitored at the time of hot cutting.

11.12 Tank Entry

Before anyone enters a tank or other confined space a competent person must inspect and test the confined space and issue a Confined Space Entry Permit listing any specific precautions that must be taken. These will include full breathing apparatus where there is any possibility of oxygen deficiency or petroleum or other toxic vapours, and personal protective equipment to suit the circumstances. See also section 13 Special Hazards.

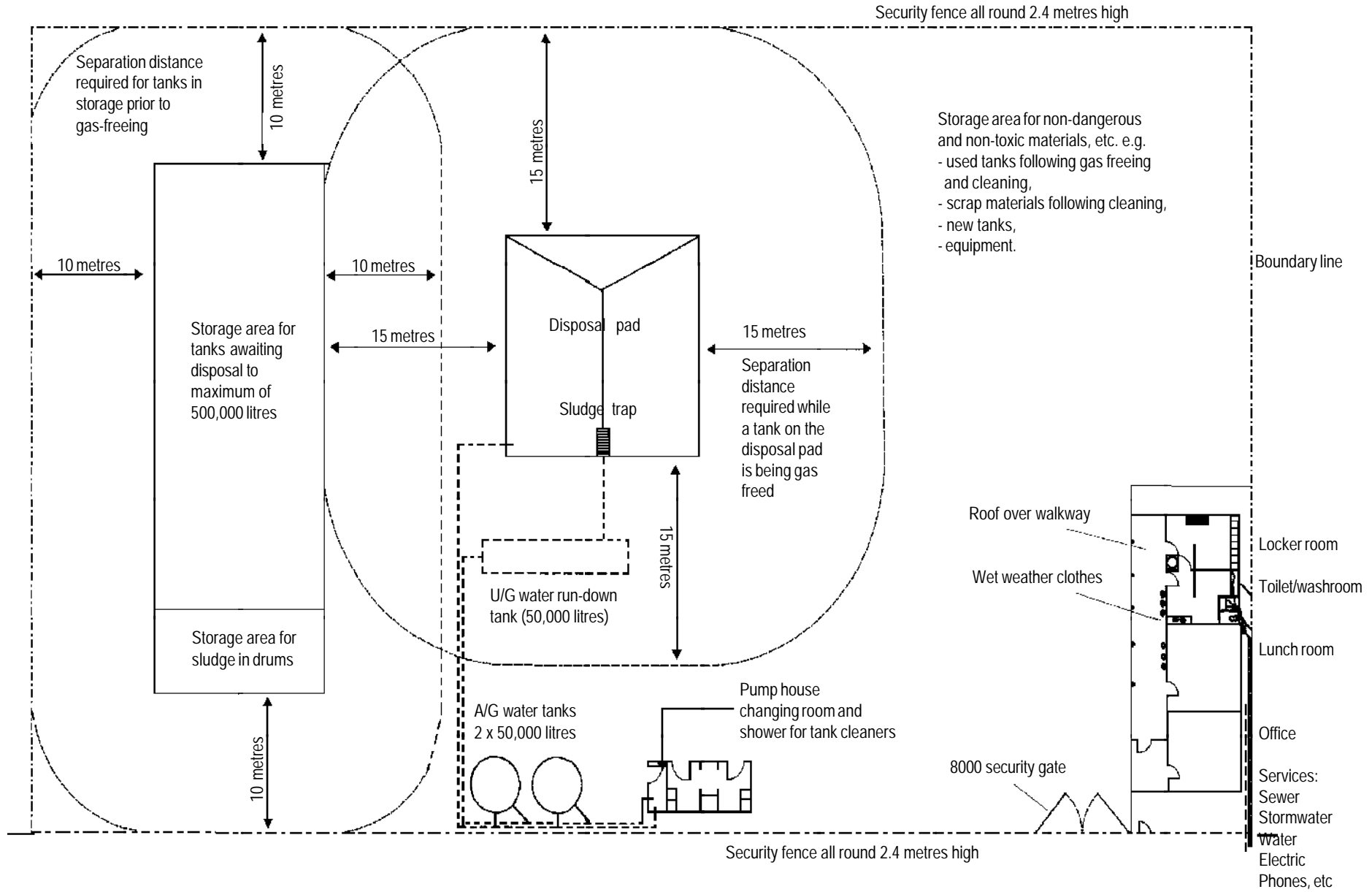


Fig. 1 Typical Tank Disposal Site Layout

In addition, any person entering a confined space must wear safety harness and safety rope, and be attended by a second person watching over him/her from outside the tank, with breathing apparatus at hand. At least one other person must be available, within call, to assist should it be necessary.

A Confined Space Entry Permit is shown in appendix 10.

11.13 Tank Cleaning

Once entry has been gained, the tank should be cleaned internally of any remaining waxes and sludge. The external surfaces should also be cleaned in preparation for cutting into manageable sections. Continue to cut the tank steel into appropriately sized sections for subsequent removal to an approved furnace operation for melting down.

The internal surfaces of the tank should only be handled when wearing gloves. Additional protection such as a barrier cream applied to the hands may also be used.

11.14 Scrap Tank Materials

Scrap steel cut from the tank must be flame cleaned or grit/shot blasted as set out in Octel Instruction Publication No. 5-01/92, before being released from the site.

Any scale generated by cleaning operations and any other scrap materials from the tank must be collected and treated as hazardous waste.

All storage, movement and disposal of scrap materials must be documented, as for hazardous wastes. See section 12: Treatment and Disposal of Hazardous Waste.

12. TREATMENT AND DISPOSAL OF HAZARDOUS WASTES

12.1 Responsibility and Legal Requirements

It is mandatory for all parties involved in the cleaning of petroleum tanks to ensure that the disposal of the residual hazardous wastes, e.g. leaded sludge and scale, or scrap tank materials, is not in breach of local or central government regulations applicable in the area where the operation is taking place.

Compliance with these requirements is the responsibility of the contractor.

12.2 Description of Leaded Petroleum Sludge

The residue remaining in leaded petrol storage tanks after all recoverable petrol has been removed consists of liquid and solid matter. It is poisonous. Any tank that has been used to store leaded product at any time must be considered a lead hazard.

All lead compounds are toxic, and organic lead compounds are particularly poisonous. They can be absorbed by breathing the vapour or dust, by swallowing dust or dirt from face or hands, or by direct absorption through the skin.

The liquid consists of two phases:

- Water containing dissolved lead salts and some organic matter; and
- Hydrocarbons floating on the water.

The solids, formed mainly by the rusting of the steel tank, consist of a mixture of iron oxides, water, petrol and, inorganic and organic lead compounds.

The following is a typical analysis:

Constituent	% m/m	ppm
Iron oxide	60	
Water	29	
Petrol	10	
Total Lead (as Pb)	Up to 1.0	0 to 10,000
Organic Lead (as Pb)	Up to 0.025	0 to 250

(With the trend towards lower lead levels in petrol, it is possible to find sludges which have lower total and organic lead levels.)

12.3 Hazards Associated With Sludge

The toxic hazard presented by leaded sludge is principally that of volatile organic lead compound vapour in air.

Additional hazards may arise from vapour coming from clothing contaminated with the sludge.

- Sludges are likely to contain gasoline vapours which will be a flammable/explosive hazard.
- The petroleum product residues likely to be found in wet sludge can cause skin burns and repeated exposure can lead to dermatitis.

Adequate protection against both these hazards will be given by wearing appropriate *personal protective equipment* and *respiratory equipment* and close attention to personal hygiene (see 11.7.3 and 11.7.4).

12.4 Pre-Treatment of Sludge to Remove Excess Liquid

Before any steps to reduce the toxicity of sludge can be taken, excess liquid should be removed from the sludge by allowing it to settle and running off the surface liquid.

All liquid run off shall be recovered and stored in approved containers before being disposed of in an approved manner.

The liquid must not be allowed to drain into the ground, into ditches, or to contaminate agricultural or domestic water supplies. Disposal must not be in breach of local or national regulations.

12.5 Treatment of Sludge to Reduce its Toxicity

The choice of method to reduce the toxicity of the sludge and for its final disposal should be made with the following factors in mind:

- The need to comply with all safety and environmental regulations of both local authority and central government;
- The amount of sludge requiring disposal;
- The location of the operation in relation to suitable sites for decontamination and/or final disposal; and
- The ability of a contractor to dispose of sludge safely.

Since the principal toxic hazard of sludge arises from the organic lead compounds, it is important to reduce their concentrations to an acceptable level or to otherwise render the sludge innocuous to ensure final safe disposal. Recommended methods are contained in Octel Instruction Publication No. 5 - 01/92, and must be followed.

12.6 Disposal of Sludge

Some contractors may not wish to involve themselves in treatment to reduce the toxicity of leaded sludge, but will wish to dispose of it as it is removed from the tanks.

- Where a contractor stores leaded sludge on-site, storage is to be in sound and sealed marked drums, in a separate dangerous goods compound, and each drum is to be numbered and documented to ensure that disposal at some later date can be monitored.
- The contractor must give the principal, in writing, full details of how he/she intends to treat and dispose of the sludge.

12.7 Documentation of Disposal

It is the contractor's responsibility to ensure that, when any wastes resulting from tank disposal are removed from his compound, that movement is documented.

The recipient must also fully document the receipt, movement and final disposal of the wastes.

Before final disposal of these wastes, e.g. in hazardous waste landfill, the contractor must obtain all necessary documentation and consents from the local and regional authorities and copies of these are to be made available to the principal on request.

13. SPECIAL HAZARDS

Additional protective clothing shall be worn for the operations involving possible lead hazard in accordance with the following table:

	Cold cutting operations	Gas or plasma cutting operations	Rust and sludge removal (Confined space)
Approved dust mask*	Yes	Yes	No
Canister breathing apparatus**	Optional to approved dust mask	No	No
Airline breathing apparatus	Not required	Optional to canister breathing apparatus	Yes
Gumboots (PVC) (steel-capped)	Yes	Yes	Yes
Full cotton overalls	Yes	Yes	No
PVC overalls or disposable overalls	Optional	No	Yes - either
Washable or disposable headcap	Yes	Yes	Yes
PVC gloves	Yes	No	Yes
Welding gloves	No	No	No
Earmuffs	Yes	Optional	No

* Such as Protector 2000 half face mask nuisance dust cartridge or 3M 8710 disposable masks.

** Half or full face mask with organic vapour canister.

Other masks may be approved provided the manufacturer can demonstrate their suitability for use with lead hazards and that they meet Octel requirements in all aspects.

14. INSURANCE

The amounts of insurance cover that a contractor takes out must be agreed between the principal and the contractor. However, the following types of insurance are suggested:

- Public liability insurance — third party personal injury.
- Public liability insurance — third party property damage.
- Pollution insurance — if not included above.
- Employee accident insurance — in addition to ACC and likely to increase in importance as ACC moves out of the “death by accident” field.
- Vehicle fleet insurances for land transport of hazardous substances.

- Transit insurance — the load (i.e. tanks) are not considered part of the vehicle and provision should be made for any liability which the load itself could cause.
- Because of the hazardous nature of the load, the insurance company should be advised of this to ensure full disclosure had been made. Otherwise the insurance company may decline liability.
- Copies of insurance cover to be made available to the principal.

15. RECOMMENDED EQUIPMENT CHECKLIST FOR TANK DISPOSAL

15.1 Disposal Pad and Separator

Minimum requirements are:

- A concrete or similarly impervious floor large enough to hold the largest tank to be treated, and to containing contaminated drainings.
 - Well sealed at any construction joints to prevent escape of any contamination into the ground.
 - Located at least 15 metres from any source of ignition.
- A suitable separator/recycling facility to allow water, sludge and product separation, and product draw off.
- Holding tanks for waste product and sludge.
- Suitable pumps that do not constitute a source of ignition for removing waste product and waste sludge.

15.2 Hazardous Tanks Storage Area

To be 15 metres from the disposal pad and any source of ignition, or any areas to which the public has access or any adjacent areas not under the direct control of the contractor where hot work may be carried out. To be well clear of the line of the axis of any tank standing on the disposal pad ready for cutting (to avoid impact should a tank end blow out during cutting).

15.3 Hot and Cold Cuffing Equipment

Plasma cutter and/or oxygen/acetylene cutting equipment

Pneumatically-operated nibbler

Pneumatically-operated drill

Air compressor of adequate capacity

Air extractor pneumatically driven

Air blower with EXD motor or air drive.

15.4 Cleaning Equipment

Steam generator and cleaner, or

Water blast equipment

Adequate supply of clean water

Flame cleaning or grit/shot blasting equipment.

15.5 Vapour Tester

Vapour Tester meeting requirements of section 8.1 and certified calibration gas, calibration register and competent person to calibrate and operate the instrument.

(See Octel Instruction Publication 01/92 Section 9 for Explosimeter pertaining to leaded gasoline.)

15.6 Oxygen Meter

Oxygen meter meeting the requirements of section 8.1.

15.7 Breathing Apparatus

Positive pressure air supplied respirators are to be used for work involving the removal of rust and sludge.

See section 13 for reference to other respirators and masks.

15.8 Personal Protective Equipment

- PVC proofed gloves
- Hard-capped oil and grease resistant gumboots
- Disposable overalls or PVC overalls
- Washing facilities for protective clothing
- Safety glasses
- Head protection (hard hats) and head caps if necessary.
- Suitable, washable, disposable clothes for use under overalls.

15.9 Changing/Washrooms

A changing/washroom facility where those engaged in handling or cleaning tanks that may have contained leaded products, or who may have been in contact in any way with leaded sludge, can strip off their work clothing, shower and thoroughly wash themselves down with soap and hot water and move on to a separate clean dressing room to don their street clothes. "Clean" and "dirty" areas of the facility must be segregated and operated so that no contamination can be carried over to the clean side. Dirty clothes must remain on the dirty side and must be thoroughly laundered before reuse. PVC overalls, gloves and boots, etc. which are not suitable for laundering must be thoroughly washed down before reuse.

15.10 Trained Personnel

All those engaged in the management, supervision and handling of tanks destined for disposal must demonstrate their knowledge and understanding of sound methods of organising and carrying out the work for which they are responsible, and of protecting themselves and others from the hazards involved.

15.11 Lifting Equipment

Should be available to handle tanks up to 50,000 litres capacity.

15.12 Dangerous Goods Regulations

A copy of the current Dangerous Goods Regulations shall be displayed in a place where it can be conveniently read by all those employed, whether as management, staff or contractors.

15.13 Fire Fighting Equipment

At least four dry powder extinguishers, each containing not less than 2kg of dry powder, shall be held in readily accessible positions on site. Of these, two shall be placed near the working area whenever any hot work is being carried out with a further two extinguishers held in reserve, in a handy position, away from the working area.

15.14 Waste Disposal Facilities

Required to legally dispose of sludge and product waste. (Octel Instruction Publication No. 5 (01/92) Section 11.)

15.15 Scrap Metal Disposal

- Scrap disposal facility. (Octel Instruction Publication No. 5 (01/92) section 11.);
- Certificate of Indemnity from scrap dealer.

15.16 Transport Facilities

Vehicles used to transport tanks that are not gas free must comply with Dangerous Goods Regulations and MOT Regulations (as specified in the Standards Association of New Zealand code NZS 5433:1988 *The transport of hazardous substances on Land*).

The requirements include:

- Licensing of vehicles;
- Licensing of drivers for special class “L” hazardous certification;
- Fire fighting equipment (NZS 5433: section 9.1: paragraph 11) (1 x 6kg dry powder);
- Hazardous class 3 signage (NZS 5433: section 4.2);
- “Hazchem” signage (NZS 5433: section 4.2.7.4); and
- “New Zealand Hazardous Substances Dangerous Goods Declaration” for each hazardous load (NZS 5433: section 8). (See also section 10.3.)

In addition, each vehicle should carry the equipment and fittings likely to be needed (except where supplied by the contractor) including:

- Tank vent
- Tie down straps — 2 tonne minimum capacity
- Assorted plugs, caps and nipples
- Disposable overalls
- Gloves
- Breakdown hazard triangles
- First aid kit
- Cellphone
- Fluorescent paint spray can.

Set of stencils including:

- Class 3 Flammable Liquid Diamond

- “Tank has contained leaded petrol/diesel. Not gas free. No hot work to be attempted on this tank until it has been certified gas free. Not suitable for storage of food or liquid for human or animal consumption.”

15.17 Fencing

Whole area is to be fully fenced, with a suitable security fence approved by the Dangerous Goods Inspector.

15.18 Signage

- Flammable Liquids Store — NO SMOKING
- Class 3 label signs
- “Hazchem” signs as appropriate for substances stored on the site
- Toxic/poison signs (for sludge storage/weathering)
- Company sign with emergency after hours telephone numbers
- Visitors NO UNAUTHORISED ENTRY. Leave matches and any sources of ignition at office.

15.19 Water Discharge System

Large enough to cope with the water volumes used ensuring that water runoff from the pit will not flood the area or contaminate the ground, or surface or ground water.

The quality of the waste water discharged to any public drainage system is to meet the required Regional Council and/or Territorial Authority Standards.

15.20 Emergency Response Plan

The tank disposal contractor shall prepare and display in a prominent place the emergency response plan which shall list the actions to be taken in case of any emergency that may occur on site. Consideration must be given to:

- Explosion
- Fire
- Spillage or leakage of dangerous or environmentally hazardous materials.

The response plan shall also list the people and organisations to be contacted, and their telephone numbers in case of emergency.

The tank disposal contractor shall ensure that all those employed on the site are familiar with the response plan.

16. SUPERVISION BY THE CONTRACTOR OF THE STORAGE AND DISPOSAL PAD SITE

The explosive and toxic nature of tank disposal work requires trained “hands on” supervision at all times.

The supervisor will be responsible for the following:

- Personal attendance during all operations.
- Correct employee clothing and footwear.
- Correct equipment for any work inside a tank, including safety harness and lifeline. A standby assistant shall be stationed close by outside the tank to

provide backup assistance during work inside any tank. The person outside the tank should have visual sight of persons inside. Further back up in case of emergency should be within calling range.

- Correct distance between tanks and buildings (at least 15 metres clear).
- Keeping the disposal pad clean of oil and waste residues, and scrap materials.
- Ensuring only one empty tank is on the processing area at any one time.
- Ensuring no matches or other prohibited items are present in the vicinity of the tanks.
- Ensuring correct health and cleanliness procedures are observed.
- Ensuring there is no vehicle or plant movement within 15 metres of the tank being processed.
- Recovery/disposal of products and wastes.
- Ensuring records and manifests are completed for the storage on site and transportation from the site of all wastes and scrap steel. Records must include all relevant details such as origin, destination and quantities.

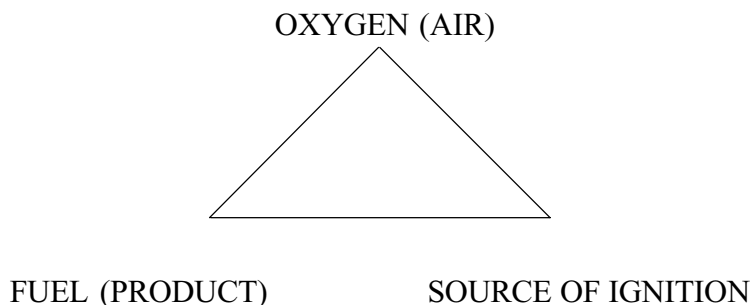
17. SAFE HABITS

The important points to remember are:

- IF IN DOUBT—DON'T! CHECK TWICE—DO IT ONCE

If any doubt exists regarding procedures, advice should be sought from the principal's project engineer or the nominated competent person.

- Consider all Class 3 containers to contain:
 - EXPLOSIVE VAPOURS
 - TOXIC FUMES
 - TOXIC SLUDGE
- Care should be taken when handling contaminated residues as they are:
 - FLAMMABLE
 - TOXIC COMPOUNDS
 - and can release TOXIC FUMES
- Remember this EXPLOSION/FLAME TRIANGLE



18. REFERENCES

- Dangerous Goods Act 1974
- Dangerous Goods (Class 3 - Flammable Liquids) Regulations 1985/188
- Associated Octel Coy Ltd. Publication 01/92. Leaded Gasoline Tank
Cleaning and Disposal of Sludge. *Octel Instruction Publication No. 5 01/92*).
- Standards Association of New Zealand code NZS 5433:1988 *The Transport of
Hazardous Substances on Land*
- Truck Loading Code*, chapter 17: Land Transport Division of the Ministry of
Transport
- Hazardous Goods Storage Facilities. A Code of Practice for Storage Tanks
and Ancillary Equipment*: Occupational Safety and Health Service, Department
of Labour
- Guide on Sources of Ignition Where Dangerous Goods are Present*, Occupational
Safety and Health Service, Department of Labour
- The Cleaning and Gas Freeing of Tanks Containing Flammable Residues*:
Occupational Safety and Health Guidance Note CS15.
- Code of Practice for the Removal, Repair and Destruction of Underground
Storage Tanks (Class 3)*: Occupational Safety and Health Service, Department
of Labour
- Safe Working in a Confined Space*: Australian Standard AS 2856-1986
- Hot Work on Drums and Tanks*: Occupational Safety and Health Service,
Department of Labour
- The Health and Safety in Employment Act 1992
- The Construction Regulations 1961
- The Electricity Regulations 1993
- API Bulletin 1604
- API Bulletin 2202
- API Manual: *Disposal of Refinery Wastes*, Chapter 5: Oil Water Separator
Process Design
- Waste Management Guide 03*: Leaded Petrol Sludge Treatment and Disposal,
Department of Health, September 1988
- NECAL Report Series 87/3—The Disposal of Sludge from Leaded Petrol Tanks*:
Dr. M T Jones, Dr. A G Bingham
- Code of Practice for the Design Installation and Operation of Underground
Petroleum Storage Systems*: Occupational Safety and Health Service,
Department of Labour.

APPENDIX 2

EMPTY TANK TRANSPORTATION REQUIREMENTS

Principal's company name: _____ Address: _____

Tank number: _____ Capacity: _____ Product: _____

Tank has previously contained leaded gasoline? Yes No Not known

Point of origin: _____

Destination: _____

The contractor shall ensure:

- (a) Tank is empty (no tank shall be transported whilst containing free product).
- (b) Tank is vented using approved vent fitted with 500 micron nominal aperture brass gauze. Tanks shall not be transported whilst pressurised.
- (c) All other openings are plugged to prevent the escape of vapour or entry of any source of ignition.
- (d) Tank is marked with tank number and the common name of the product it contained, i.e. petrol, diesel, kerosene, etc.
- (e) Appropriate Class diamond is displayed, at least 40 cm x 40 cm in size. Warning to read: "Class 3 Flammable Liquid, no smoking or naked light within 8 metres."
- (f) Tank to be labelled in accordance with the *Code of Practice for the Design Installation and Operation of Underground Petroleum Storage Systems, 1992*, section 11.1.7.
- (g) Spray paint on the tank and the site name it came from.
- (h) Transport operator must carry *New Zealand Hazardous Substances Dangerous Goods Declaration*. Form No: NZS 5433:1988.

i. _____
(Name of contractor responsible for making tank gas tight)

Please arrange to transport the tank as detailed below.

Project engineer: _____
Signature

Date: ____ / ____ / ____

2. Tank approved gas tight

Contractor: _____
Signature

Date: ____ / ____ / ____

3. Tank delivered

Transport operator: _____
Signature

Date: ____ / ____ / ____

4. Tank received

Receiving depot: _____
Signature

Date: ____ / ____ / ____

5. Permit must be returned to: Principal's project engineer

Owner of tank: _____

Pick up from: _____

Deliver to: _____

APPENDIX 3A

WASTE DISPOSAL REGISTER: REMOVAL CERTIFICATE

Form of certificate to be rendered to the principal by contractors removing liquid waste produced by tank disposal operations from disposal contractor's premises.

To: _____
(Principal)

Copy to: _____
(Tank disposal contractor)

Movement/Disposal Certificate

WE undertake to dispose of the liquid waste produced by our tank disposal operations and removed from _____ at _____ on ____ / ____ / ____ in such a manner as will not contravene any Government Regulations or Local Bylaw and to issue the required notices to the responsible authorities and to undertake any necessary analyses.

WE undertake to notify the principal's engineer in writing of the date and location of disposal of the waste and to provide to him a copy of any chemical analysis of the treated waste prior to disposal.

Signed: _____
(Signature)

(Name in block letters)

On behalf of: _____
(Waste disposal contractor)

(Address)

Drum or batch identification No: _____

APPENDIX 3B

WASTE DISPOSAL REGISTER: DISPOSAL CERTIFICATE

Form of certificate to be rendered to the principal by contractors removing liquid waste produced by tank disposal operations from disposal contractors premises.

To: _____
(Principal)

Waste Disposal Certificate

WE certify that we have disposed of the wastes produced by tank disposal operations and listed below in a manner that does not contravene any relevant Government Regulations or Territorial Authority Bylaw or requirement.

The wastes listed below were disposed of at (location) _____ on ___ / ___ / ___

Waste treatment prior to disposal (details) _____

Chemical analysis of waste required prior to disposal? Yes/No

(If "Yes", attach copy of certificate of analysis)

Signed: _____
(Signature)

(Name in block letters)

On behalf of: _____
(Waste Disposal Contractor)

(Address)

Quantity of wastes: _____

Drum or batch identification No: _____

Chemical Analysis Certificate attached: _____

TANK DISPOSAL NOTICE AND ACCEPTANCE

To: _____ Date: ___ / ___ / ___

Location: _____

Tank Description: _____

In accordance with the Dangerous Goods Act 1974 we hereby advise you that this tank has held dangerous goods of Class 3 and is liable to contain flammable liquid or vapour. The tank has not been cleaned of such liquid or vapour by steaming or any other approved process.

This equipment may have or may still contain leaded sludge. The equipment shall not be used for the storage of drinking water or foodstuffs.

Furthermore, as the new owner of this tank, you must take notice that the following Dangerous Goods Regulations apply:

Regulation 55: Alterations and Repairs to Tanks

1. No person shall make any alteration to any tank for the storage of any dangerous goods of Class 3 (other than repairs to the tank or its fittings) except with the approval of the local licensing authority, and every person carrying out any repairs to any such tank shall ensure that adequate precautions are taken for the prevention of accidents from fire or explosion.
2. No person shall remove any such underground tank from the ground until all openings in the tank are securely closed and made gas tight.

Regulation 56: Disused Underground Tanks

1. Where any underground tank that has been used for storage of dangerous goods of Class 3 ceases to be used, and where any such underground tank is situated on premises that have ceased to be licensed for the storage of dangerous goods, the tank shall be removed by the owner thereof unless permission to the contrary is given in writing by the licensing authority within whose area the tank is situated.
2. Any permission given by a licensing authority under sub clause (1) of this regulation shall be subject to such conditions as the licensing authority thinks fit.
3. Where any underground tank is required to be removed under the provisions of subclause (1) of this regulation, but by reason of its situation under a building or for any other reason it is impracticable to carry out the removal, the tank shall be filled with some solid incombustible material such as sand, and all openings in the tank shall be securely closed vapour tight.

4. Where any filling pipe or dipping pipe which has been attached to any under ground tank for dangerous goods of Class 3 ceases to be used the owner shall either remove the pipe or shall close it in such a fashion that no attempt can be made to use it.

Regulation 194: Storage of Used Containers Exceeding Five Litres

No person shall keep or store any container of capacity exceeding five litres which has contained dangerous goods of Class 3 (a) that has not been freed from flammable liquid and vapour, except in a licensed depot or an open yard or other storage place for dangerous goods permitted by these regulations, unless the container is secure from access by unauthorised persons and reasonably free from danger from fire, and is securely closed by a bung screwed well home, or in some other approved manner.

Regulation 195: Disposal of Containers

No person shall dispose of any container which has contained dangerous goods of Class 3 or permit any such container to be disposed of unless he has taken reasonable precautions to ensure that any remaining dangerous goods or flammable vapour or gas therefore will not be a hazard to persons or property.

Regulation 196: Sale or Disposal of Containers Exceeding Twenty Litres

No person shall sell or otherwise dispose of or permit disposal of any container of capacity exceeding twenty litres which has contained dangerous goods of Class 3 (a) unless all dangerous goods and flammable vapour have been removed by an approved method, or the person given possession of the container has been notified in writing that it has held dangerous goods and is liable to contain flammable liquid or vapour.

Regulation 197: Repairs to Used Containers

No person shall repair or cause or permit to be repaired any container which has held dangerous goods of Class 3, nor shall any person bring or permit any source of ignition to be brought into such container or so near thereto as to create a hazard, unless that container has first been cleared of all traces of dangerous goods and flammable vapour by an approved method.

Provided that this regulation shall not prohibit the carrying out of such servicing and repairs as will not create or involve a source of ignition, and the work is carried out in accordance with conditions approved by an Inspector.

The above notice has been read, understood and accepted by me prior to taking delivery of the tank and I acknowledge receipt of a copy of this notice.

Signed: _____ Date: ____ / ____ / ____

SAFE HANDLING OF PETROLEUM PRODUCTS

General

All petroleum products are hazardous. They can cause explosion or fire.

Most petroleum products are toxic when not used with due care.

Fire and Explosion

All petroleum products must be treated as being potentially explosive even in small quantities.

Petrol, aviation gasoline and most solvents evaporate readily, producing an explosive mixture with air. Kerosine, aviation turbine fuel and the less volatile solvents can also produce explosive vapours, particularly in poorly ventilated areas. All products can accumulate static electricity which may trigger an explosion — kerosine type products are particularly susceptible.

Automotive diesel, fuel oils and lubricating oils can produce explosive conditions if sprayed or heated, even over small areas.

Precautions Against Fire and Explosion

Keep all sources of ignition away from petroleum products and their vapours.

Sources of ignition include:

- Matches, lighters and cigarettes, etc.
- Any flame or spark.
- Any non-flameproof electrical equipment, including switches, hand torches, electric radiators, lamps, vacuum cleaners, power tools, radios, telephones and cellphones.
- Welding sets, leads, connections and hand pieces.
- Gas welding torches.
- Motor vehicles and all internal combustion engines.
- Tools which can cause a spark if dropped, etc.
- Grinders.

Petroleum vapours are heavier than air and will readily collect in pits, drainage sumps, cellars, and any low areas. Small quantities of vapour can be quickly and safely dispersed by efficient rapid ventilation.

- The presence or absence of petroleum vapours can be checked by competent operator using an explosimeter.
- **Do not enter any tank or pit** that has contained or does contain petroleum products unless it has first been tested and a safety certificate issued by a competent person.
- **Do not do any hot work** (e.g. welding, gas cutting, grinding, drilling or power wire brushing) on any tank or container that has not been tested and certified gas free by a competent person, or that still contains any product.

- **Do not transfer or pour petroleum** products from one container to another, without ensuring that both containers are fully earthed, and that an effective earthing connection is made between hose nozzle and receiving container before any transfer is started, and is maintained as long as the transfer continues.

Toxic Hazards

Petroleum vapours can quickly asphyxiate. At lower concentrations, they irritate the eyes and lungs, and may cause nausea, headache and depression.

Petroleum products will irritate the eyes and skin and may cause dermatitis on prolonged or repeated contact.

In addition, high octane petrol and aviation gasolines contain toxic lead compounds. Internal surfaces of tanks which have contained these products will be contaminated and must be treated as highly toxic, even after all product has been removed.

Precautions Against Toxic Hazards

- Use an airline breathing apparatus in any confined space.
- Avoid splashing, or any contact with the eyes or skin.
- Wear PVC gloves and boots, and cotton overalls. Wear goggles or face shield if splashing is possible.
- If clothing gets contaminated with product, remove under a running shower.
- If eye or skin contact occurs, treat as under First Aid Treatment (see next page).

Notes for Physicians

Administration of medicinal liquid paraffin may reduce absorption through the digestive tract. Gastric lavage should only be done after endotracheal intubation in view of the risk of aspiration which can cause serious chemical pneumonia for which antibiotic and corticosteroid therapy may be indicated. Motor gasolines may contain lead compounds, however, the quantities involved are unimportant in the context of the treatment of acute gasoline poisoning.

EMERGENCY ACTION

In case of petroleum spillage

- If a spill occurs, extinguish all naked flames.
- Shut down any other potential sources of ignition.
- Ensure area is well ventilated.

Small spill: Absorb spills using sand, earth, or a proprietary absorbent and clean up.

Large Spill: Contain and pump into storage.

- Alert Emergency Services (Telephone 111).
- Advise OSH/Dangerous Goods, Regional Council and Territorial Local Authority.
- Do not allow spill to escape into drains or waterways.

Petroleum Fire

- Use dry powder, foam, BCF, or carbon dioxide extinguishers.
- Do not use water jets—these will spread the fire.
- Call Emergency Services (Telephone 111)

Note: Any BCF extinguishers should be replaced with dry powder, carbon dioxide or foam extinguishers after use. BCF is not considered “environmentally friendly”.

First Aid Treatment

Petroleum Products Swallowed

- Do not induce vomiting: The main hazard following accidental ingestion is aspiration of the liquid into the lungs which is often fatal. Children are more susceptible than adults.
- Give 250mls (1/2 pint) of milk to drink. If not available, give water.
- **Send to the hospital immediately.**

Eye Contact

- Wash with copious amounts of water for at least 10 minutes.

Skin Contact

- Drench the skin immediately with cold water.
- Remove contaminated clothing under a running shower and wash all contaminated skin with soap and water.

Inhalation

- Move victim to fresh air.
- Keep the patient warm and at rest.
- If unconscious, place in the recovery position.
- If patient not breathing, give artificial respiration.
- Give cardiac massage if necessary.
- Send to the hospital.

Medical Treatment

See Notes for Physician (previous page).

APPENDIX 7

GAS TEST CERTIFICATE FOR HOT WORK

Required gas test frequency: Flammable vapours: Continuous*/Every _____ hours*/Once only*

Oxygen: Continuous*/Every _____ hours*/Once only*

- The Area/Tank/Nessel/Pipeline/Equipment* has been tested and is free from all flammable vapours and gases.
- Sewers, drains and low points are free of flammable vapours and gases.*
- Sewers, drains and low points are covered and sealed against sparks and flashbacks.*

This certificate is valid from: _____ hours on ___ / ___ / ___ to _____ hours on ___ / ___ / ___

Signature of Authorised Gas Safety Tester _____ Time _____ hours Date ___ / ___ / ___

RENEWAL OF GAS TEST CERTIFICATE:

Date	
Time	
Initials A.G.S.T	

*Delete words not applicable

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APPENDIX 8

CONFINED SPACE ENTRY PERMIT

CONFINED SPACE ENTRY PERMIT (Delete Part 1. or Part 2.)

For both parts, ensure that documented official emergency procedures and equipment are in place before work commences.

Part 1. Confined space not being gas freed.

- The confined space may contain toxic and/or flammable vapours and/or insufficient oxygen to support life.
- The space may only be entered providing compressed airline breathing apparatus is used and the Department of Labour has been notified.
- A lifeline and harness must be worn by each person working inside the space.
- Each person shall have an attendant holding the free end of the lifeline.
- Attendant must observe the person working inside at all times and in the event of something going wrong the first action must be to raise the alarm.
- The attendant must be in immediate audible contact with backup assistance.
- Additional precautions: *(To be filled in by the person issuing permit)*

Has confined space contained leaded product? YES/NO

If YES, full Octel Precautions are required.

Has the tank been fitted with a nitrogen blanket? YES/NO If YES, all connections must be removed.

Part 2. Confined space gas freed for entry.

- The confined space was personally inspected and tested by me and the space is free of all flammable vapours and contain not less than 20% and not more than 21% of oxygen by volume.

Time	Date	Signature	Time	Date	Signature
hours	___ / ___ / ___		hours	___ / ___ / ___	
hours	___ / ___ / ___		hours	___ / ___ / ___	
hours	___ / ___ / ___		hours	___ / ___ / ___	

ENTRY INTO VESSEL/CONFINED SPACE/VEHICLE/TANK

24. The vessel must remain positively isolated from all line connections by removing lengths of connecting pipework or by installing line blanks.
25. Approved airline breathing apparatus must be used. All users must be able to demonstrate competence in use.
26. (a) Lifeline and harness must be worn by each man working inside each vessel/confined space with an attendant holding the free end of the line. Attendant must observe the man working inside at all times and must be in a position to haul the man out.
 (b) Where this is not practical, an attendant with SCBA must be ready to enter the tank for rescue purposes after first raising the alarm.
27. Electrical power to vessel stirrer must be isolated and locked-out. Before entry into vessel, isolation must be confirmed by pressing local start button.
28. Oxygen level monitored continuously by an approved monitoring device.
29. Gas cylinders must not be taken into confined space. Torches must be removed during breaks and end of each working period.

ACCIDENTS DURING LEADED GASOLINE TANK CLEANING

OCTEL INSTRUCTIONAL PUBLICATION No. 5

REPRINTED MAY 1988 (APPENDIX 2)

Fatal accidents still occur, mainly in terminals operated by marketing companies, during the cleaning of leaded gasoline tanks. This appears to be caused by one or more of the following:

- Lack of communication between all parties involved;
- The hazards involved were not fully appreciated;
- Poor or inadequate supervision of the cleaning operations;
- The equipment provided was either unsuitable or misused.

A summary of some of the fatal accidents of which we are aware, most of which have occurred in marketing installations, is given below:

Case Histories

Accident A

A very large underground tank, which had contained leaded gasoline, was to be cleaned. The tank was first drained of product then flushed shell-full with sea water, with all manholes open. The cleaners then entered the tank and worked on rafts floating on the water while the level was gradually lowered. High pressure water jets were used to clean the sides of the tank. Workmen wore overalls, boots, gloves and airline respirators. Sludge was removed from the bottom of the tank by scraping it, wet, into open drums.

In spite of supervision by trained personnel, men were found to have been removing their respirators in the tank, and the contractor's supervisor was entering the tank for short periods without a respirator.

The compressor supplying the breathing air was situated downwind of the tank and rubber hoses were used.

The operators had considerable experience in tank cleaning and thought this particular tank was cleaner than others, due to absence of smell and low lead-in-air readings.

Twenty-three operators were treated for TEL poisoning and eight died.

Basic Cause — Lack of proper initial inspection to ensure that the correct equipment was used and lack of proper supervision during the job.

Accident B

A semi-underground tank which had contained aviation gasoline was being cleaned. Men were wearing safety equipment in good condition but were:

- Putting on protective clothing close to the entrance to the tank where fumes could be inhaled;
- Spending rest periods close to the tank where fumes could be inhaled;

- Not cleaning PVC suits immediately after use but were leaving them dirty for up to four days.
- Taking off contaminated suits themselves with bare hands.
- Descaling dry tanks wearing dust masks instead of air-supplied respirators.
- Handling sludge outside the tank without respirators.
- The foreman did not wear any respiratory protection and spent most of the working day in a semi-underground passage which was adjacent to the entrance to the tank and had no forced ventilation. He also frequently looked into the tank without any respiratory protection.

The foreman died, two men were admitted to hospital with TEL poisoning (they subsequently recovered), and five others showed evidence of abnormally high lead absorption.

Basic Cause — Lack of competent supervision above foreman level resulting in failure to follow correct procedure outside the tank.

Accident C

A group of men were working at a pit containing sludge from a leaded gasoline tank on a very hot day. Some of them remained for several hours downwind of the pit. Although some operators wore canister respirators, others had removed their respirators in the absence of the supervisor who had been called away to deal with a fire.

One man died, and three others were admitted to hospital with lead poisoning but subsequently recovered.

Basic Cause — Lack of constant supervision owing to the absence from the job of the supervisor, resulting in the work being carried out in an incorrect manner.

Accident D

A leaded gasoline tank was cleaned in conditions of high temperature and humidity by a gang of local labour.

A detailed investigation showed that:

- Sludge was handled outside the tanks by men not wearing canister respirators;
- Men wearing contaminated clothing were resting outside the tank in the vicinity of contaminated equipment and ground;
- Rubber airlines hoses and respirators fitted with breathing bags were used;
- The removal of the contaminated cement wash in the tank by chipping was carried out by men wearing only dust masks;
- The supervisor, although having long experience of the work, was not temperamentally suitable for the work, and was absent from the site for some time while work proceeded.

Two men died and several others were admitted to hospital suffering from lead poisoning.

Basic Cause—Complete lack of proper inspection to ensure that correct methods and equipment were used during the job.

CONTRACTOR CERTIFICATION QUESTIONNAIRE

1. Contractor

Name of business:

Address:

PO Box number:

Telephone number:

Fax number:

Owners:

Manager:

Key personnel name:

Position:

After hours contact:

Telephone number:

2. Size and Scope of Business

- Area of operations
- Types of work undertaken
- How long established in these types of work?
- Approximate ratio of oil industry work to total work.

3. Resources

- Number of personnel — total.
- Number of personnel trained in UPSS removal and lifting.
- Number of personnel trained in transport of underground storage tanks.
- Number of personnel trained in gas freeing of underground storage tanks.
- Number of personnel trained in cutting and disposal of under ground storage tanks.
- Equipment available — e.g. excavators, trucks, compressors, welders, de-watering pumps, product pumps, thief pumps, and cutting, flame cleaning and grit blasting equipment, etc.
- Instrumentation — explosimeter, calibration equipment, calibration and use records, and competent operators.
- Oxygen meter, calibration and use records, competent operators.
- Communications: cellphone, radio telephone.

4. Special Skills

To be listed by contractor.

5. Experience in Underground Petroleum Storage Systems in Last Three Years

- Removal of tanks steel fibreglass
- Removal of pipework steel fibreglass
- Transport of tanks removed steel fibreglass
- Gas freeing of tanks
- Tanks destroyed (scrapped)
- Tanks cleaned
- Cleaning and disposal of tank materials
- Treatment of leaded sludge
- Disposal of leaded sludge
- Testing of tanks and pipework
- Any unusual problems encountered.

6. Training and Experience of Key Personnel (*Contractor to list*)

Name	Position	Training and Experience
------	----------	-------------------------

7. Safety Policy and Record

- How many lost time incidents in last 3 years?
- How many man-days lost in last 3 years?
- Types of accidents resulting in lost time
- Nature of injuries incurred
- Any incidents involving people other than own personnel in last **three years**
- Any incidents involving equipment or construction works without personal injury in last three years (brief details required)
- Formal safety policy
- Management involvement in monitoring safety record
- Management involvement in promoting safe working
- Safety training undertaken in last three years:
- In-house
- Other
- Medical checks for management and staff.

8. Safety Protection Provided

- Personnel — overalls, safety boots, safety glasses, ear muffs, wet weather gear.
- Explosive gas detector, flame proof torches, flame proof pumps, etc.
- Oxygen Meter
- Meter calibrations and certification
- Breathing apparatus
- Public — barricades and lights, danger signs, danger tape
- Medical examinations — blood and urine tests.